REMARKS/ARGUMENTS

Claims 18 and 20-26 are pending in this application. By this Amendment, Applicant AMENDS claims 18 and 21-26 and CANCELS claims 19 and 27-34.

Applicant appreciates the Examiner extending the courtesy of the telephone interview on April 1, 2008. During the telephone interview, Applicant's representative proposed incorporating the features of claim 19 into claim 18 and pointed out the Lutjering et al. ("Titanium") does not teach or suggest that a modified layer obtained by shot peening should be 10 vol% of the surface region. The Examiner indicated that Lutjering et al. teaches chemically milling a titanium surface, and thus it might have been obvious to chemically mill a shot peened surface. Applicant's representative pointed out that Lutjering et al. clearly teaches in the last sentence of the first full paragraph on page 114 that if a surface is chemically milled, then the surface should be shot peened again to create or restore the compressive stress in the titanium part.

Applicant affirms the election of Group I, including claims 18-26. Further, Applicant reserves the right to file a Divisional Application to pursue Group II, including claims 27-34.

Applicant notes that the Examiner crossed through the International Search Report listed in the Information Disclosure Statement filed January 11, 2006. Applicant respectfully requests that the Examiner state in the next Office Action whether or not the International Search Report has been received and the information contained therein considered. See M.P.E.P. § 2001.06(a).

Claim 18 was rejected under 35 U.S.C. § 102(b) as being anticipated by Wagner ("Mechanical Surface Treatments on Titanium, Aluminum, and Magnesium Alloys"). Claim 18 was rejected under 35 U.S.C. § 102(b) as being anticipated by Lutjering et al. Claims 19-26 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Lutjering et al.

Applicant has canceled claim 19 and incorporated the features recited therein into claim 18. Applicant respectfully traverses the rejections of claim 18 and 20-26.

Claim 18 has been amended to recite:

> **A titanium alloy part having a compressive stress of approximately 270 MPa or more within a depth of about 100 μm from a surface thereof**; wherein
>
> a surface region extends from the surface to a depth of about 100 μm, and an internal region is disposed internally relative to the surface region; and
>
> **the surface region includes a modified layer containing more α phase than does the internal region, the modified layer accounting for a proportion of about 10 vol% or less of the surface region**. (emphasis added)

With the unique combination and arrangement of features recited in Applicant's claim 18, including the features of "A titanium alloy part having a compressive stress of approximately 270 MPa or more within a depth of about 100 μm from a surface thereof" and "the surface region includes a modified layer containing more α phase than does the internal region, the modified layer accounting for a proportion of about 10 vol% or less of the surface region," Applicant has been able to provide a titanium part having excellent durability (see, for example, paragraph [0009] of Applicant's substitute specification filed on January 11, 2006).

The Examiner alleged that each of Wagner et al. and Lutjering et al. teaches all of the features recited in Applicant's claim 18, including a "titanium alloy part having a compressive stress of approximately 270 MPa or more within a depth of about 100 μm from a surface thereof."

Applicant has amended claim 18 to recite the feature of "the surface region includes a modified layer containing more α phase than does the internal region, the modified layer accounting for a proportion of about 10 vol% or less of the surface region." Support for this feature is found in, for example, original claim 19.

Since claim 19 was not rejected over Wagner, Applicant respectfully submits that the prior art rejection over Wagner is moot.

The Examiner alleged that Lutjering et al. teaches overpeening should be avoided which can actually reduce fatigue life and that it would have been obvious to one of ordinary skill in the art "to modify the shot peening intensity to yield a given amount of alpha phase by volume at the surface of a titanium alloy part." Alternatively,

the Examiner alleged that "it would have been obvious to one of ordinary skill in the art at the time of the invention to choose the instantly claimed ranges through process optimization, since it has been held that [w]here the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art." Applicant respectfully disagrees.

Although Lutjering et al. cautions against overpeening, Lutjering et al. teaches that the entire surface region of the titanium part should be shot peened several times (e.g., 200-400% coverage is typical) as long as the appropriate intensity (pressure) is selected (see, for example, the two full paragraphs on page 117 of Lutjering et al.). However, Lutjering et al. does not specifically teach the vol% of the modified layer in the surface region of the titanium part.

Fig. 3.62 of Lutjering et al. shows that three different shot peening pressures (4 bar, 6 bar,10 bar) will obtain a compressive stress of approximately 270 MPa or more within a depth of about 100 μm from the surface, wherein a shot peening pressure of 4 bar appears to result in a compressive stress of approximately 270 MPa at a depth of about 100 μm. Thus, it would be expected that a shot peening pressure of 4 bar would obtain a modified layer having a thickness of about 20 μm to about 40 μm (see, for example, paragraph [0045] of Applicant's substitute specification). Accordingly, the modified layer would account for about 20 vol% to about 40 vol% of the surface region. Obviously, for shot peening pressures of 6 bar and 10 bar, the modified layer would account for more than about 20 vol% to about 40 vol% of the surface region since the increased pressure would result in the modified layer extending deeper into the surface region.

It is very important to note that the shot peening pressure of 2.5 bar in Fig. 3.62 of Lutjering et al. does not result in a compressive stress at a depth of about 100 μm. Although a shot peening pressure lower than 4 bar might result in a modified layer having less than about 20 vol% to about 40 vol% of the surface region, it is clear from Fig. 3.62 of Lutjering et al. that the lower shot peening pressure will not result in the required compressive stress of approximately 270 MPa or more at a depth of 100 μm.

Fig. 3.62 of Lutjering et al. clearly illustrates that a lower shot peening pressure will obtain a lower vol% of the modified layer but also will obtain a lower compressive stress (i.e., less than 270 MPa), while a higher shot peening pressure will obtain a higher compressive stress but also obtain a higher vol% of the modified layer.

From the above, it is apparent that the Examiner's allegations on pages 6 and 7 of the outstanding Office Action that it would have been obvious to one of ordinary skill in the art to modify the shot peening pressure to yield a given vol% of the modified layer in the surface region (i.e., about 10 vol% or less, as recited in claim 18) and a compressive stress of approximately 270 MPa or more at a depth of 100 μm (as also recited in claim 18) is not possible in view of the teachings of Lutjering et al.

Thus, Lutjering et al. clearly fails to teach or suggest the features of "A titanium alloy part having a compressive stress of approximately 270 MPa or more within a depth of about 100 μm from a surface thereof" and "the surface region includes a modified layer containing more α phase than does the internal region, the modified layer accounting for a proportion of about 10 vol% or less of the surface region," as recited in Applicant's claim 18.

During the telephone interview on April 1, 2008, the Examiner alleged that Lutjering et al. teaches in the first full paragraph on page 114 that chemical milling may be used to remove material from the surface of a titanium part that has become contaminated, for example by oxygen, "during processing." Presumably, the Examiner believes that this would reduce the vol% of the modified layer of the surface region. It appears that the "processing" referred to by Lutjering et al. includes removing an oxide formed on the surface of the titanium, not damage caused by shot peening. Furthermore, in the more detailed description of chemical milling on pages 121-122 of Lutjering et al., there is absolutely no mention of chemically milling a shot peened surface.

Regardless, Lutjering et al. states in the last sentence of the first full paragraph on page 114 that "Chemically milled surfaces are often shot peened to create or restore surface residual compress stress." Thus, even if Lutjering et al. suggests chemically

milling a shot peened surface, Lutjering et al. clearly teaches that the surface should be shot peened again to restore the compressive stress, and thus increase the vol% of the modified layer in the surface region of the titanium part.

Accordingly, Applicant respectfully requests reconsideration and withdrawal of the rejection of claim 18 under 35 U.S.C. § 102(b) as being anticipated by Lutjering et al. Furthermore, for the reasons indicated above, Applicant respectfully submits that a rejection of claim 18, as amended, under 35 U.S.C. § 103(a) as being unpatentable over Lutjering et al. would be improper.

In view of the foregoing amendments and remarks, Applicant respectfully submits that claim 18 is allowable. Claims 20-26 depend upon claim 18, and are therefore allowable for at least the reasons that claim 18 is allowable.

In view of the foregoing amendments and remarks, Applicant respectfully submits that this application is in condition for allowance. Favorable consideration and prompt allowance are solicited.

The Commissioner is authorized to charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 50-1353.

Respectfully submitted,

Dated: April 10, 2008

/Stephen R. Funk #57,751/
Attorneys for Applicant

KEATING & BENNETT, LLP
8180 Greensboro Drive, Suite 850
Tyson's Corner, VA 22102
Telephone: (703) 637-1480
Facsimile: (703) 637-1499

Joseph R. Keating
Registration No. 37,368

Stephen R. Funk
Registration No. 57,751